A climate model for Africa?

South Africa Science and Technology Delegation Meeting
Washington DC

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NOAA/GFDL

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Talk outline. . .

1. Scientific Basis
   - Multi-model ensembles
   - Focus shifts to regional climate change
2. NOAA/GFDL's role
   - Community models and data archives
   - Partnerships with other centers
3. NOAA/GFDL and ACCESS

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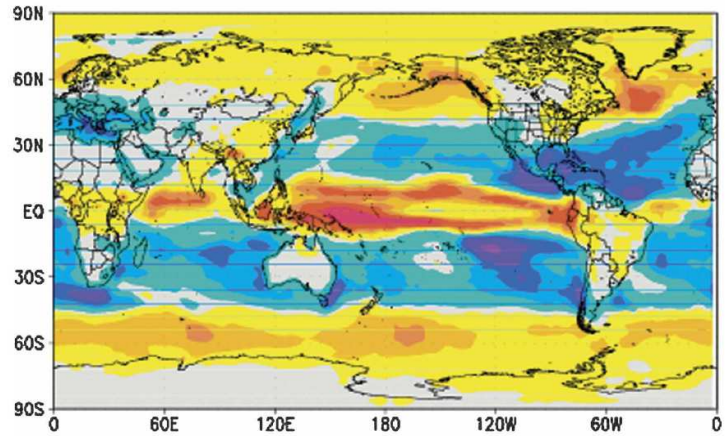
IPCC and other modeling campaigns

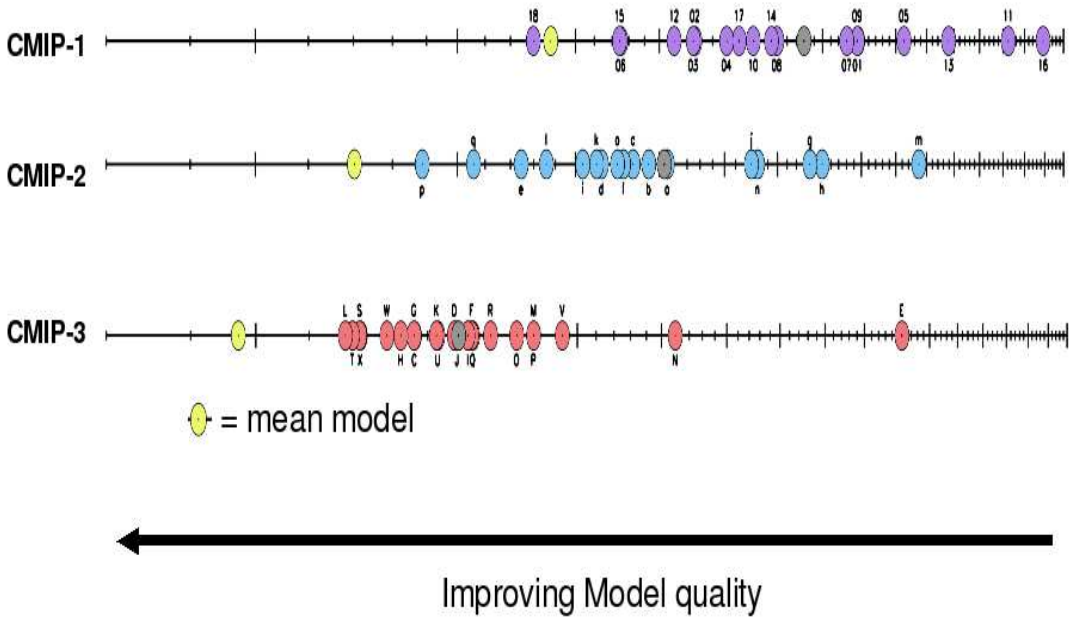
The use of *multi-model ensembles* (coordinated experiments run across many models and institutions) has become a central methodology for generating consensus and uncertainty estimates of climate change.

Model	Modeling Center
BCCR BCM2	Bjerknes Centre for Climate Research
CCCMA CGCM3	Canadian Centre for Climate Modeling & Analysis
CNRM CM3	Centre National de Recherches Meteorologiques
CSIRO MK3	CSIRO Atmospheric Research
GFDL CM2_0	Geophysical Fluid Dynamics Laboratory
GFDL CM2_1	Geophysical Fluid Dynamics Laboratory
GISS AOM	Goddard Institute for Space Studies
GISS EH	Goddard Institute for Space Studies
GISS ER	Goddard Institute for Space Studies
IAP FGOALS1	Institute for Atmospheric Physics
INM CM3	Institute for Numerical Mathematics
IPSL CM4	Institut Pierre Simon Laplace
MIROC HIRES	Center for Climate System Research
MIROC MEDRES	Center for Climate System Research
MIUB ECHO	Meteorological Institute University of Bonn
MPI ECHAM5	Max Planck Institute for Meteorology
MRI CGCM2	Meteorological Research Institute
NCAR CCSM3	National Center for Atmospheric Research
NCAR PCM1	National Center for Atmospheric Research
UKMO HADCM3	Hadley Centre for Climate Prediction



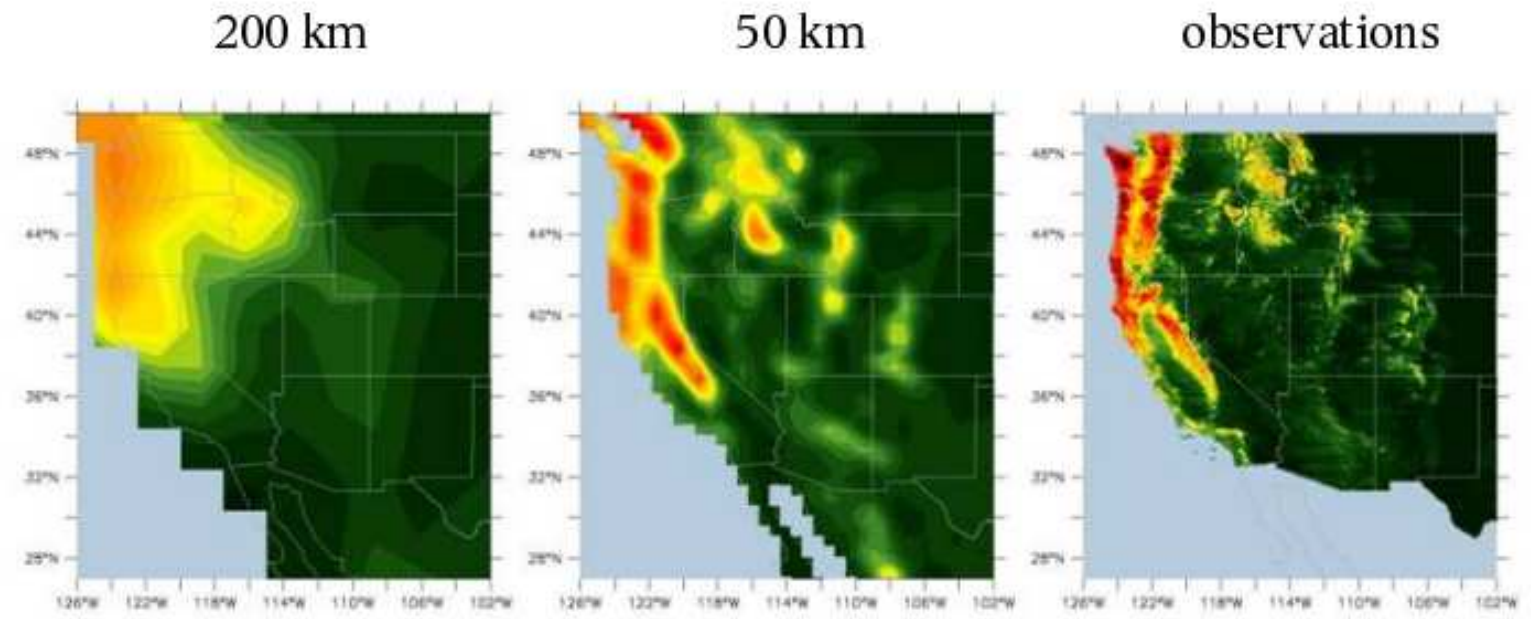
Composite analyses are run across many models in a central archive.

The "mean model" is best! (Reichler et al 2006)



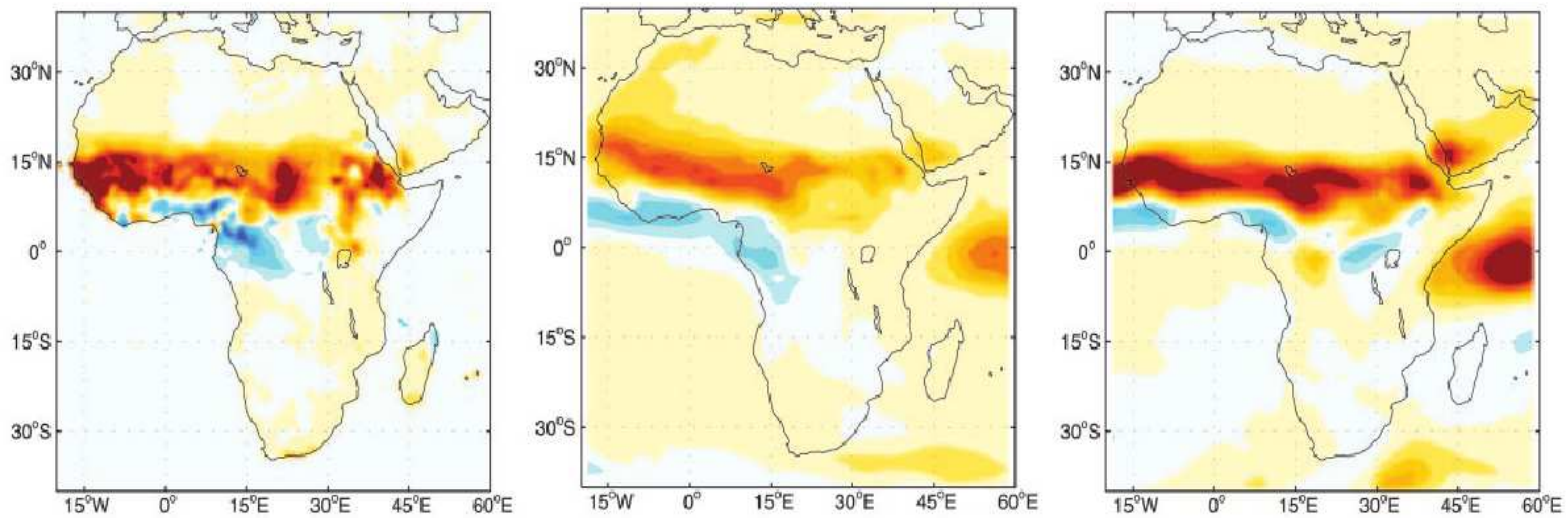
- Model quality is improving with time, by many metrics.
- In many cases, models are sampling “error space” randomly, so “consensus model” is best. (Not always so.)

Regional scales increasingly important

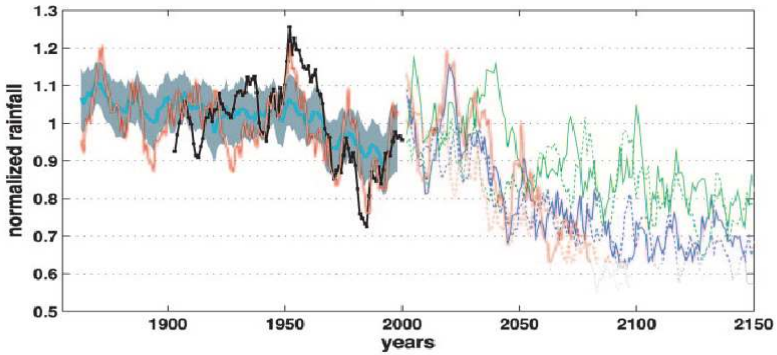


- There is a dramatic improvement in our ability to model regional scale climate response as we go to “high” (i.e beyond the IPCC AR4 norm) resolution.
- It may not be possible to perform global studies at sufficient resolution: regional models play a role.

Sahel rainfall trends: Held et al 2006



- GFDL modeling studies suggest catastrophic Sahel drought is a “climate risk”.
- However, this not a consensus result across many models. . .



A role for regional climate centers of excellence

- Regional climate change is becoming a key focus area, requiring study with both global models and regional models.
- There are many more regional climate change studies that we can conceive of than we can possibly perform!
- One approach is to nurture the development of centers of excellence specializing in climate regions.
- Example: AMMA, African Monsoon Multidisciplinary Analyses.
  - AMMA: `http://amma.mediasfrance.org/`
  - AMMA-US: `http://www.eol.ucar.edu/projects/amma-us/`

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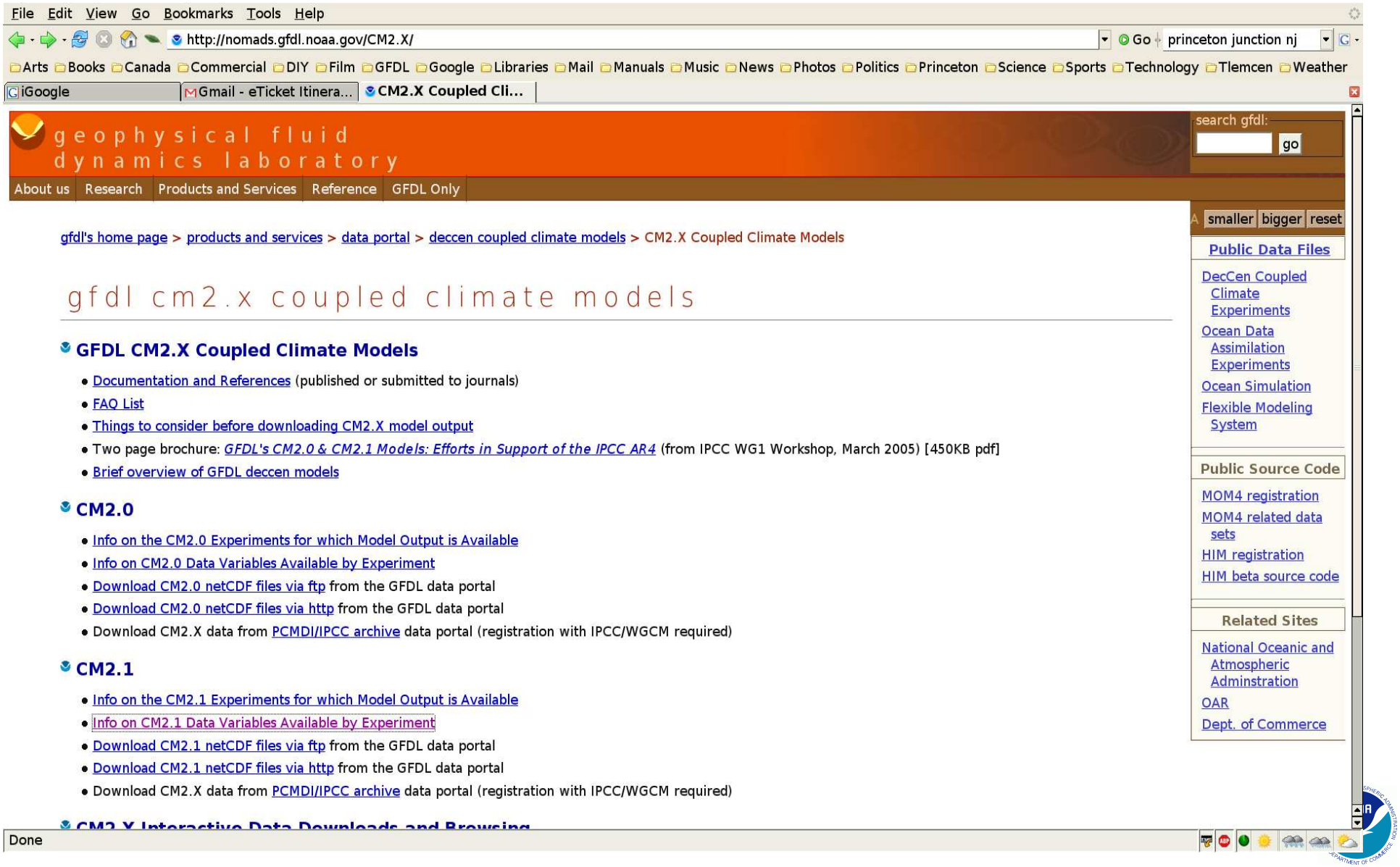
GFDL Community Models and Data Archive



GFDL partnerships

- GFDL models play central roles in international modeling campaigns on global climate change (IPCC), regional climate change (NARCCAP), short-range forecasting (ENSEMBLES), . . .
- GFDL models are publicly available and widely used across the world. The GFDL Modular Ocean Model (MOM4) in particular, is a community ocean model with a huge user base.
- In 2004, we set up the Indian Ocean Modeling Group after a workshop in India: collaborative research continues to flow from IOMG.

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Proposed collaboration between GFDL and ACCESS

- The proposed collaboration between NOAA/GFDL and ACCESS (Africa Centre for Climate and Earth System Science) was initiated by George Philander, Professor of Geosciences, Princeton University, also now at University of Cape Town.
- Proposal currently involves a series of hands-on workshops to nurture expertise in South Africa on running GFDL models. Initial workshop, focused on MOM, runs from 10-20 March 2008 in Cape Town. Future workshops will extend expertise to coupled Earth system models.
- Future: long-term stable institutional support for collaboration, coordinated modeling campaigns, visitor exchange programmes.

Thank you! Questions?